Curriculum Vitae

Dr. Shiqin Wang

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1. Education

October 2008 to September 2009 **Ph.D. Candidate in Landscape Environment**
Faculty of Horticulture, Chiba University, Japan

September 2006 to July 2009 **Ph.D. in Physical Geography**
Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Science, China

September 2003 to July 2006 **Master in Hydrogeology and Water Resources**
College of Resources and Environment, Chinese Geosciences University (Beijing)

September 1999 to July 2003 **Bachelor in Hydrogeology and Water Resources**
College of Resources and Environment, Jilin University, China

2. Professional Experiences:

July 2014 to Present **Researcher**
Center for Agricultural Resources Research Institute of Genetics and Developmental Biology, CAS

October 2009 to April 2014 **Post Doctor Researcher**
Faculty of Horticulture, Chiba University, Japan

July 2011 to April 2013 **Research fellowship**
Faculty of Life and Environmental Sciences
University of Tsukuba, Japan

January 2010 to June 2011 **Research Associate**
National Institute for Environmental Studies, Tsukuba, Japan

3. Honors and Academic Awards (2009-2013):

- 28/09/2009 - 8/03/2010, Foundation for Supporting Young Researcher, Association of Graduate Schools of Science and Technology (AGSST), Chiba University;
- 11/2009, Award for "the best lecture in Session 21", the 36th IAH Congress, Toyama, Japan;
- 1/10/2008 – 30/09/2011, Excellent Student Scholarship, Chiba University, Japan;
- 07/2009, Award for Graduate Excellence (Ph.D), Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Science, China;

4. Major Research Interests and Selected Research Projects:

1) Past Research and Achievements

Groundwater is the major water supply for human activities especially in arid or semi-arid regions. However, the natural water cycle has been changed greatly and several problems related to unsustainable groundwater use have arisen such as decrease of runoff, decline of groundwater level and groundwater contamination. It is urgent to study the mechanism of water cycle involved with groundwater.

My past research is focused on the mechanism of water cycle, groundwater recharge, relationship of precipitation-soil water-groundwater, interaction of groundwater-surface water and the fate/transport of nitrate contaminants in groundwater of alluvial fan/plain area influenced by climate change and human activities. I have been engaged in employing interdisciplinary methods to achieve my research aims. The multi-tracer technique, mathematic statistics methods and numerical simulation method, in conjunction with the traditional hydrologic approach are employed to resolve these hydrologic issues. My past research and major achievements can be generalized into four sections as follows:

I. Mechanism of precipitation infiltration and interaction of surface water-groundwater

- Based on the observation data of soil water potential and stable isotopes, the interaction of precipitation-soil water-groundwater was compared at two experimental sites. Two soil water movement models were constructed to estimate the amount of precipitation infiltration, evapotranspiration, soil water storage and groundwater recharge. My research verified that the local precipitation is not the dominant recharge source in the plain area due to the strong evapotranspiration effect and large storage capacity of heterogeneous unsaturated zone. *(Advances in Water Science, 2008,in Chinese; Hydrological Process, 2009) (Natural Resources, 2010, in Chinese)*
- On local scale, the impacts of a largest linear wastewater channel of North China Plain on groundwater were studied. An Evaporation and Leakage model based on Rayleigh evaporation distillation of isotopes (δ^2H and $\delta^{18}O$) was developed which provided a new method for estimating the leakage and evaporation of a river channel. The influence range and extent of the linear surface water on groundwater was estimated by using this method.*(Science of the Total Environment, 2014)*
- On watershed scale, the interaction of river water and groundwater with different relief and hydrological conditions was studied when the oxygen and hydrogen isotopes and CFCs tracers were combined. *(Hydrological Processes, 2014, submitted)*

II. Processes of water quality evolvement and the mechanism of nitrate contamination in groundwater

The researches were conducted in the Lake Baiyangdian Watershed, North China Plain, which delegates a semi-arid climate. Based on the understanding of groundwater flow system, the processes which influence the water quality was studied when considering the change of land-use and wastewater discharge in mountain area and plain area, respectively.

- As the recharge area of the groundwater in North China Plain, the change of land-use of history period has a significant impact on the nitrate contamination in present groundwater, combing the water chemical, nitrate isotope and CFCs tracers. *(Hydrological processes, 2014, minor revision)*
- The mechanism of nitrate fate from the domestic and industrial wastewater to groundwater was compared. It was revealed that the frontier and lake depression of alluvial fan in the lake watershed with abundant organics, silt and clay sediments provide suitable conditions for denitrification. *(Environmental Science: Processes & Impacts, 2013)*

III. Construction of assessment system of groundwater resources coupled with groundwater flow model (MODFLOW) and geological information system (GIS)

- The six dynamic patterns of groundwater level in North China Plain were subdivided combining with the different climate and human exploration factors. The macro-dynamics features of six sub-regions of shallow groundwater and the periodicity fluctuations of groundwater level were analyzed with spectrum analysis method. *(Acta Geographica Sinica.,2009; Environmental Earth Science, 2011)*
- MODFLOW is a groundwater modelling program which can be compiled and modified according to the practical applications. An integrated groundwater flow numerical simulation modelling system of MODFLOW and GIS was developed to assess the groundwater resources. (Geographical Research, 2007, in Chinese)
- Generally, recharge occurred only in the top layer or the first layer of the model. In my research, a new package named by “Recharge and Discharge Package” was added into this integrated system to dispose the total recharge and discharge occurred at all aquifer layers. (Environmental Geology, 2008)

2) Present and Future Work

One of my present research aims strives to study the transport and source of nitrate in groundwater in Lake Baiyangdian watershed of North China Plain. I have obtained extensive expertise results in investigating the nitrate characteristics by using multi-tracers method, and in identifying the geochemical reaction during the groundwater flow process. A groundwater model has been constructed to simulate the groundwater flow and solute transport. Based on my previous research of coupling the groundwater modeling software of MODFLOW with GIS, the future research will be focused on coupling the water cycle and solute transport by developing a physically based numerical model framework influenced by agriculture activities.

The integrated modeling of surface-subsurface is an effective tool for interpretative understanding of groundwater withdrawal, fertilizer and manure application and groundwater environment in the agricultural region. The groundwater flow system and the processes of flow and solute transport are the important components for the nitrate leaching and transport. However, studies on the nitrate leaching, transport process in groundwater, and integrated modeling are generally separate in the highly agriculture-intensive region. Therefore, quantification of the coupled hydrological, hydrogeological and geochemical process of the

watershed under various surface conditions such as fertilizer application, livestock waste leakage and land use scenarios of agricultural activities is needed.

My future work will be focused on the North China Plain, to construct a integrated water-solute model which will be based on the understanding the water cycle mechanism. The field work will be carried out on the three field experiment sites including Luancheng, Nanpi and Yuanshi. The future directions include the following 3 aspects:

I. Mechanism of water cycle, nitrate leakage, heavy metal transport in unsaturated zone

The world is facing a water scarcity challenge, where agriculture is the major user of water. In addition to the increase in water scarcity, the agricultural sector faces an enormous challenge of producing almost 50% more food by 2030 and doubling production by 2050. To improve the food production, application of chemical fertilizer and animal manure are increased. However, overuse of fertilizers has resulted in contamination of surface water and groundwater which contaminate crops and transmit disease to consumers and farm workers. It is important to use the water resources effectively and to avoid the groundwater contamination in the North China Plain.

Some achievements on the mechanism of precipitation infiltration and recharge to groundwater have been got in our previous researches. Many researches in the Center for Agricultural Resources Research have been carried out to explore the water cycle, nitrate leakage flux of soil-water interface and nitrate transport. Based on these works, our research will be still focused on the relationship of precipitation, soil water and groundwater to study the impact of different processes in the unsaturated zone on groundwater quality. Especially, the nitrate and heavy metal transport in wastewater irrigation areas is the key point of our research.

II. Interaction of surface water-groundwater and the compiling mechanism

In the arid/semi-arid climate regions where the global warming and human activities have led to the decrease of the runoff, dry-up of rivers, and the decline of groundwater level, the interaction of surface water and groundwater has been greatly changed.

We have developed the evaporation estimation method by using the theory of isotope distillation in the Baiyangdian watershed. In the future, the theory will be applied on the other linear surface water to analyze the mechanism of the evaporation and infiltration of isotopes. On the other hand, the factors which influence the interaction of river-lake-groundwater are analyzed to couple the surface water and groundwater in the model.

III. Integration of water cycle and solute transport model

Based on the understanding of the mechanism of water and nitrate cycle, hydrogeological and geochemical processes controlled by the groundwater flow system, an integrated model by combining the existing model of nitrogen index simulation and groundwater simulation software to assess water/fertilizer management and quantitatively rank the potential risk to the environment effectively across an agriculture region of the North China Plain.

Nitrogen Leach and Economic Analysis Package (NLEAP) will be used to estimate leaching index, including nitrate available for leaching, amount of nitrate leached, movement risk index. Subsurface-perspective model code of MODFLOW/MT3D will be used as the groundwater calculation program. I had mastered the programming code of this software and I can modify the source code during the integration process with GIS.

5. Funding and Laboratory Personnel

- The 100 Talents Program and Key Topics in Innovation Engineering of Chinese Academy of Science, 2014-2019.
- National Natural Sciences Foundation of China “Sources and Fate of Nitrate in Gourndwater of the Transition Zone between Mountain and Plain Areas of North China” 2015-2018

6. Selected Publications:

1） S. Wang, C. Tang, X. Song and R. Yuan. Hydrol. Process. (Submitted)(2014).
2） S. Wang et al. Hydrol. Process. (Minor revision) (2014).
3） S. Wang et al. Sci. Total Environ. DOI: 10.1016/j.scitotenv(2014)
4） S. Wang et al. Using major ions and δ15N–NO3- to identify nitrate sources and fate in an alluvial aquifer. Environmental Science: Processes & Impacts15, 1430-1443 (2013).
5） S. Wang et al. Environ Earth Sci. 66, 729-739 (2011).
6） X. Song, S. Wang*, G. Xiao, Z. Wang, X. Liu, P. Wang. Hydro. Proces. 23, 1376-1388 (2011).
7） S. Wang et al. Journal of Geographical Sciences 19, 175-188 (2009).
8） S. Wang et al. Environ. Geol., 55, 1449-1462 (2008).

7. Editorial Duties

I do not take on any editorial duty.

8. Conference Organization

I do not participate in any conference organization.